CLAIMS

1. (Withdrawn) A system for transmitting and receiving data comprising:

a direct-conversion receiver receiving a signal modulated on a carrier frequency signal, the direct-conversion receiver further comprising one or more subharmonic local oscillator mixers;

a local oscillator coupled to the direct conversion receiver, the local oscillator generating a signal having a frequency equal to a subharmonic of the carrier frequency signal; and

a transmitter coupled to the local oscillator.

2. (Withdrawn) The system of claim 1 wherein the direct conversion receiver further comprises:

a phase shifter coupled to a first subharmonic local oscillator mixer, where the output of the first subharmonic local oscillator mixer is used to generate a quadrature signal of a phase shift keyed signal; and

a second subharmonic local oscillator mixer, where the output of the second subharmonic local oscillator mixer is used to generate an in-phase signal of a phase 'shift keyed signal.

3. (Withdrawn) The system of claim 2 wherein the phase shifter is further coupled to the local oscillator.

4. (Withdrawn) The system of claim 2 further comprising a low-noise amplifier coupled to the phase shifter, wherein the signal modulated on the carrier

frequency signal is received by the low-noise amplifier and is transmitted to the phase shifter after being amplified.

5. (Withdrawn) The system of claim 1 further comprising a frequency multiplier coupled between the local oscillator and the transmitter, wherein the frequency multiplier increases the frequency of the oscillator.

6. (Withdrawn) The system of claim 5 wherein the frequency multiplier increases the frequency of the oscillator up to the frequency of the carrier signal.

7. (Withdrawn) The system of claim 1 wherein the transmitter comprises:

a frequency multiplier coupled to the local oscillator; and

an in-phase/quadrature modulator coupled to the frequency multiplier, receiving an in-phase modulation input signal and a quadrature modulation input signal, and outputting a quadrature phase shift keyed signal modulated at the multiplied local oscillator frequency.

8. (Withdrawn) The system of claim 1 wherein the transmitter comprises:

an in-phase/ quadrature modulator coupled to the local oscillator, receiving an in-phase modulation input signal and a quadrature phase shift keyed signal modulated at the local oscillator frequency; and

a frequency multiplier coupled phase/quadrature modulator and multiplying the quadrature phase shift keyed signal.

9. (Withdrawn) The system of claim 1 wherein the transmitter comprises:

a frequency modulator coupled to the local oscillator, wherein the local oscillator is modulated by the frequency modulator;

a phase locked loop coupled to the frequency modulator and the local oscillator; and

a switch coupled between the local oscillator and the phase locked loop, wherein the switch can couple the phase locked loop to the local oscillator during a transmit cycle and can decouple the phase locked loop from the local oscillator during a receive cycle.

10. (Withdrawn) The system of claim 1 wherein the transmitter comprises:

a frequency modulator coupled to the local oscillator, where the local oscillator is modulated by the frequency modulator;

a voltage-controlled reference oscillator coupled to the frequency modulator, where the voltage-controlled reference oscillator is modulated by the frequency modulator; and

a phase locked loop coupled to the local oscillator in a feedback loop, the phase locked loop further coupled to the voltage controlled oscillator.

11. (Withdrawn) A method for receiving and transmitting data comprising:

receiving a carrier signal modulated with a data signal;

mixing the carrier signal with a subharmonic local oscillator signal to extract a baseband signal;

multiplying the subharmonic local oscillator signal; and

modulating an outgoing data signal with the multiplied subhannonic local oscillator signal.

12. (Withdrawn) The method of claim 11 wherein mixing the carrier signal with the subharrnonic local oscillator signal to extract the baseband signal further comprises:

mixing the carrier signal with the subharmonic local oscillator signal to extract an in-phase signal;

phase-shifting the subharmonic local oscillator signal; and

mixing the carrier signal with the phase-shifted subhannonic local oscillator signal to extract a quadrature phase signal.

13. (Withdrawn) The method of claim 11 wherein mixing the carrier signal with the subharmonic local oscillator signal to extract the baseband signal further comprises:

mixing the carrier signal with the subharmonic local oscillator signal to extract an in-phase signal; phase-shifting the carrier signal; and

mixing the phase-shifted carrier signal with the subharmonic local oscillator signal to extract a quadrature phase signal.

14. (Withdrawn) The method of claim 11 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

multiplying the subharmonic local oscillator signal; and

modulating an outgoing in-phase data signal and an outgoing quadrature phase data signal with the multiplied subharmonic local oscillator signal.

15. (Withdrawn) The method of claim 11 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

modulating an outgoing in-phase data signal and an outgoing quadrature phase data signal with the subharmonic local oscillator signal to generate a modulated outgoing data signal; and

multiplying the modulated outgoing data signal to generate the outgoing data signal.

16. (Withdrawn) The method of claim 11 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

frequency modulating the subhannonic local oscillator signal during a transmit cycle; and

interrupting frequency modulation of the subharmonic local oscillator signal during a receive cycle.

17. (Withdrawn) The method of claim 16 further comprising opening a phase locked loop during the transmit cycle to lock the subharmonic local oscillator signal.

18. (Withdrawn) The method of claim 16 further comprising frequency modulating a reference oscillator signal of a phase locked loop that locks the subharmonic local oscillator signal.

19. (Withdrawn) The method of claim 11 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

modulating an outgoing in-phase data signal and an outgoing quadrature phase data signal with the subharmonic local oscillator signal at a subharmonic modulation index to generate a modulated outgoing data signal; and

multiplying the modulated outgoing data signal by an inverse subharmonic to generate the outgoing data signal.

20. (Withdrawn) A system for transmitting and receiving data comprising:

a low noise amplifier receiving a modulated incoming carrier signal having a carrier signal frequency;

a local oscillator generating a signal having a subharmonic frequency of the carrier signal;

a first mixer coupled to the low noise amplifier and the local oscillator, the first mixer receiving the modulated incoming carrier signal and generating an in-phase incoming data signal;

a second mixer coupled to the low noise amplifier and the local oscillator, the second mixer receiving the modulated incoming carrier signal and generating a quadrature phase incoming data signal;

a modulator coupled to the local oscillator, the modulator receiving an outgoing data signal and modulating the outgoing data signal onto the local oscillator signal to generate an outgoing modulated carrier signal; and

a transmit amplifier coupled to the modulator, the transmit amplifier amplifying the outgoing modulated carrier signal to a transmission power level.

21. (Currently Amended) A system for transmitting and receiving data comprising:

a low noise amplifier receiving a modulated incoming carrier signal having a carrier signal frequency;

a local oscillator generating a signal having a subharmonic frequency of the carrier signal;

a first mixer coupled to the low noise amplifier and the local oscillator, the first mixer receiving the modulated incoming carrier signal and generating an in-phase incoming data signal;

a second mixer coupled to the low noise amplifier and the local oscillator, the second mixer receiving the modulated incoming carrier signal and generating a quadrature phase incoming data signal, wherein the first and second mixers multiply the signal of the local

oscillator by a factor equal to the inverse of the subharmonic frequency prior to mixing the signal of the local oscillator with the carrier signal ;

a modulator coupled to the local oscillator, the modulator receiving an outgoing data signal and modulating the outgoing data signal onto the local oscillator signal to generate an outgoing modulated carrier signal;

a transmit amplifier coupled to the modulator, the transmit amplifier amplifying the outgoing modulated carrier signal to a transmission power level; and

~~The system of claim 20 further comprising~~ a general purpose computing platform coupled to the first mixer, the second mixer, and the modulator, the general purpose computing platform decoding an incoming data signal from the in-phase incoming data signal and the quadrature phase incoming data signal, and generating the outgoing data signal.

22. (Withdrawn) The system of claim 20 further comprising a telephone handset coupled to the first mixer, the second mixer, and the modulator, the telephone handset decoding an

incoming data signal from the in-phase incoming data signal and the quadrature phase incoming data signal, and generating the outgoing data signal.

23. (Withdrawn) The system of claim 20 wherein an antenna is directly connected to the low noise amplifier, and the low noise amplifier is directly connected to the one or more subharmonic local oscillator mixers.

24. (New) The system of claim 21 further comprising a telephone handset coupled to the first mixer, the second mixer, and the modulator, the telephone handset decoding an

incoming data signal from the in-phase incoming data signal and the quadrature phase incoming data signal, and generating the outgoing data signal.

25. (New) The system of claim 21 wherein an antenna is directly connected to the low noise amplifier, and the low noise amplifier is directly connected to the one or more subharmonic local oscillator mixers.

26. (New) A method for receiving and transmitting data comprising:

receiving a carrier signal modulated with a data signal;

mixing the carrier signal with a subharmonic local oscillator signal to extract a baseband signal;

multiplying the subharmonic local oscillator signal by a factor equal to the inverse of a frequency of the subharmonic local oscillator signal with the carrier signal prior to mixing the signal of the local oscillator with the carrier signal; and

modulating an outgoing data signal with the multiplied subhannonic local oscillator signal.

27. (New) The method of claim 26 wherein mixing the carrier signal with the subharrnonic local oscillator signal to extract the baseband signal further comprises:

mixing the carrier signal with the subharmonic local oscillator signal to extract an in-phase signal;

phase-shifting the subharmonic local oscillator signal; and

mixing the carrier signal with the phase-shifted subhannonic local oscillator signal to extract a quadrature phase signal.

28. (New) The method of claim 26 wherein mixing the carrier signal with the subharmonic local oscillator signal to extract the baseband signal further comprises:

mixing the carrier signal with the subharmonic local oscillator signal to extract an in-phase signal; phase-shifting the carrier signal; and

mixing the phase-shifted carrier signal with the subharmonic local oscillator signal to extract a quadrature phase signal.

29. (New) The method of claim 26 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

multiplying the subharmonic local oscillator signal; and

modulating an outgoing in-phase data signal and an outgoing quadrature phase data signal with the multiplied subharmonic local oscillator signal.

30. (New) The method of claim 26 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

modulating an outgoing in-phase data signal and an outgoing quadrature phase data signal with the subharmonic local oscillator signal to generate a modulated outgoing data signal; and

multiplying the modulated outgoing data signal to generate the outgoing data signal.

31. (New) The method of claim 26 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

frequency modulating the subhannonic local oscillator signal during a transmit cycle; and

interrupting frequency modulation of the subharmonic local oscillator signal during a receive cycle.

32. (New) The method of claim 31 further comprising opening a phase locked loop during the transmit cycle to lock the subharmonic local oscillator signal.

33. (New) The method of claim 31 further comprising frequency modulating a reference oscillator signal of a phase locked loop that locks the subharmonic local oscillator signal.

34. (New) The method of claim 26 wherein modulating the outgoing data signal with the subharmonic local oscillator signal comprises:

modulating an outgoing in-phase data signal and an outgoing quadrature phase data signal with the subharmonic local oscillator signal at a subharmonic modulation index to generate a modulated outgoing data signal; and

multiplying the modulated outgoing data signal by an inverse subharmonic to generate the outgoing data signal.